BREAK
SOUND BA

Make Your Computer Play What You Want to Hear, Whenever You Want

by Kevin M. Savetz

Tune In

THE RRIER

It's 3 a.m. and I'm listening to the day's top news stories from National Public Radio (**http://www.npr.org/**). Now it's 3:10 and I turn to a Seattle grunge band at Virtual Radio (**http://www.microserve.net/vradio**). Then the clock flashes to 3:15, and I'm learning about the Earth's core temperature on Earth and Sky, a science program (**http://www.earthsky.com/**). Three minutes later, I'm tuned in to a call-in show about NASCAR racing (**http://www.AudioNet.com/spotalk.htm**). Next, I think I'll listen to a classic rock station in Pittsburgh (WRRK at **http://ww2.AudioNet.com/pub/wrrk/wrrk.htm**), or a country music station from Paris, Texas (KOYN– **http://ww2.AudioNet.com/pub/koyn/koyn.htm**).

No, I'm not a fickle radio listener. I'm listening to all of this fare – music, interviews, talk radio, cyberjam, and excerpts from albums – over the Internet, using a relatively new, but popular, type of Web audio streaming software. It's like having a radio that can play whatever I want, when I want it. Sort of.

A Devil's Advocate View of Web Radio

You're cruising down the freeway with the top down, the sun and wind coursing through your hair. You're humming along to the rhythm of rubber on asphalt and the purr of your engine. It's definitely time to tune in to some tunes. No prob. You reach over – way over – unzip your computer case with one hand, pull out the notebook, connect up your cellular modem, plug it into the cigarette lighter, turn on the computer, launch Windows, launch Netscape, type in your password, dig through your bookmarks file, and pull up the RealAudio-enhanced page of your favorite radio station, click on the music link, and, after a brief pause, out comes the soothing tones of KISS (Detroit Rock City!) in hi-tech, monophonic sound.

Of course, by this time, you've driven the equivalent of the Alaska Highway. Sure, chances are you won't be listening to RealAudio (**http://www.realaudio.com/**) from the Internet while navigating a four-lane highway. But where do you listen to the radio? Probably in the car, or as an alarm-clock option, for music, weather, and traffic updates. So why bother with Internet radio at all?

You'll see the benefit to radio being on the net when, for example, you've moved from another region of the U.S. and you want to keep listening to the ol' stomping ground's sounds. A better example of the marriage between radio and the Internet is the MIT List of Radio Stations on the Internet (**http://wmbr.mit.edu/stations/list.html**). More than 1,000 stations are listed and sorted intuitively. A service like MIT's is perfect for the traveler. You'll know what station to set your hotel-room alarm clock to if you want to hear Howard Stern or National Public Radio.

Don't get me wrong. I'm all for streaming audio. I mean, where else could I listen to the entire soundtrack of *Plan 9 From Outer Space* (**http://www.w2.com/docs2/c4/plan.html**)? Is radio on its way out? I don't think so. Maybe when the dissemination of sound information is as practical as electronic text, then perhaps we'll be throwing away the Panasonic.

I'll have to get a snooze button installed on the computer first.

–Crystal Waters

Will Net Broadcasts Kill Radio?

All About Streaming

Internet Talk Radio (**http://town.hall.org/**) was one of the first well-known experiments in "broadcasting" on the Internet. The site, which launched in 1993, published audio files that had to be downloaded completely before they could be heard. A typical hour-long radio show consumed a whopping 20 megabytes of disk space. Internet Talk Radio was innovative, but premature – only users with expensive, high-speed Internet connections could tune in.

The Internet Jukebox (http://interjuke.com/jukebox) lets you listen to entire albums while you surf the net.

Fast forward to 1995, when a company called Progressive Networks (**http://www.prognet.com/prognet/**) created a program named RealAudio (**http://www.realaudio.com/**). This software confronted the biggest shortcoming of Internet Talk Radio – those huge, time-sucking, hard disk-eating audio files. Instead of requiring you to download a complete audio file prior to listening, RealAudio used "audio streaming." It made Internet audio viable, for the first time, for users with 14.4 Kbps modems. Several other companies have since followed suit, offering similar tools (see Sites for Sound, page 32).

The Internet Underground Music Archive (http://www.iuma.com/pages/home_page/homepage.html) is an online warehouse of tunes.

"Audio streaming" means that your computer plays sound while the sound file downloads, so you don't have to wait for the entire file to arrive before play begins. Thanks to clever programming and hearty sound compression, audio streaming applications provide "audio on demand," cutting down to just a few seconds the time you have to wait to hear a program.

Although sound on the Internet is still in its infancy, several audio streaming systems do exist. Audio streaming "players" – the software needed to listen in – are typically free, and work as helper applications or plug-ins for your Web browser. Click on an audio file, and a player launches, and sound emerges. Some programs, like RealAudio and Internet Wave (**http://www.vocaltec.com/iwave.htm**), present the listener with a set of stop, play, rewind, and fast-forward buttons. Unlike "real" radio, these programs let you stop the music if you need to step away from your desk, and pick up where you left off when you return. Even better, programs can be indexed, allowing you to jump straight to

NetTalk (http://www.nettalk.com/) is Canada's first nationally syndicated radio show about the Internet.

c|net radio (http://www.cnet.com/Content/Radio/) presents computer-oriented commentary for broadcast over the net.

the material that interests you. For instance, if you want to hear the news story on Radio Canada (**http://www.radio.cbc.ca/**) on why huge chunks of ice are breaking off of Antarctica, you can go directly there, skipping over the program's introduction.

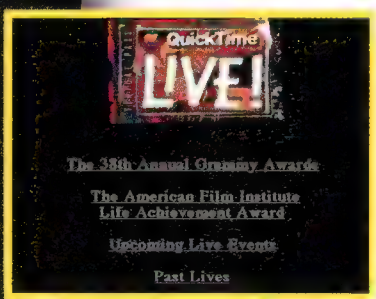
Standards are still being hashed out, and there are no "killer apps" for audio (yet). Today's streaming audio programs are not cross-compatible – if you've downloaded and installed Xing's StreamWorks (**http://www.streamworks.com/**) player, you won't be able to hear RealAudio-format sound unless you get the RealAudio player, too. The competition for the best streaming audio tool is still heated, and it's not clear if a clear victor will emerge. Victory will depend on which player offers the best sound quality, and which programs come bundled with popular browsers like Netscape Navigator (**http://home.netscape.com/**). Right now, there are more competing tools than there need to be, and the field is somewhat balkanized.

AudioNet (http://www.audionet.com/) offers live broadcasts of a dozen talk and music radio stations.

Today's experiments with audio provide interesting content, and work on any modern computer that's connected to the net. However, the technology still has hurdles to overcome – most notably, the sound quality of many of these services is low, slurred, and of low-fidelity. Sound quality depends on the speed of your Internet connection and the player you use. Due to their different compression formats, some programs produce better sound than others, and speech usually sounds better than music. RealAudio (**http:// www.realaudio.com/**), Toolvox (**http://www. voxware.com/**), and Truespeech Internet (**http:// www.dspg.com**) have been rated as providing the best speech clarity; while Internet Wave (**http:// www.vocaltec.com/iwave.htm**) and RealAudio (**http://www.realaudio.com/**) are considered the best choices for music.

CompuTalk (http://www.neosoft.com/computalk/radio/radio.html) is a talk radio show about the information age.

Still, it's fun to be on the cutting edge, listening to live feeds from radio stations three time zones away.



Apple hosts live events at its QuickTime Live site (http://live.apple.com/).

What's There to Hear?

Once you have a player or two installed, you'll find many choices for stuff to listen to – an eclectic mix of gleaming corporate audio sites and back-room sound experimentation. The content

Ambience Migrates Online

When something is anechoic, it's devoid of sound. It's ironic, then, that San Francisco-based Anechoic Media emphasizes sound in its first Web page, designed for Silent Records (**http://www.silent.org/**), an ambient experimental label launched in 1986.

First Anechoic, now Silent? No coincidence. Kim Cascone, president of Silent Records, is also the force behind Anechoic Media, along with his wife Kat. Designed by the two Cascones, the Silent site is a hyper-extension of the label itself. It's at once elegant and futuristic in its graphic presentation, yet intuitive in layout. It's also quite minimal, much like an ambient soundscape.

Cascone initially put off creating a site for his label, citing the difficulties of getting good sound quality for the music. That is, until he discovered MPEG. This technology allows him to sample a 30-second sound bite at 16-bit, 44.1 kHz in the same amount of space as an 8-bit, 22 kHz bite. (Visitors to the site can download a high-quality MPEG player demo that plays back about five seconds of audio.)

Obviously, having music available to potential customers online can't hurt, but does it actually move it off the shelves? "There's a long shot between advertising and sales," says Cascone. "We look at [the site] as a glorified television ad." But in the not-too-distant future, predicts Cascone, the Internet will be used less as an advertising vehicle for music labels and more as a forum for musicians to interact directly with their fans. This is already beginning to happen, with live music star chat sessions on America Online, for example. Cascone also expects music sites to become much like enhanced CDs, with reference material on the artists available online. Listeners may then begin to expect a visual, as well as musical, aspect to the presentation of all recording artists. Cascone also believes that once cable modems become commonplace, and bandwidth expands as a result, fully immersive, 3D environments will be possible on the net. He then hopes to create an interactive environment via VRML at the Silent site. Actual sounds will be represented by specific shapes (i.e., a bass note could be imaged as a blue sphere). The listener could then interact with both sounds and shapes, becoming an active participant in the environment, rather than a passive listener, as the case is now. The Internet could forever change the way we listen to music.

–Adam Douglas

Sites for sounds

Audio streaming software

Internet Wave: **http://www.vocaltec.com/iwave.htm**

RealAudio from Progressive Networks: **http://www.realaudio.com**

StreamWorks from Xing Technology: **http://www.streamworks.com/**

ToolVox from Voxware: **http://www.voxware.com/**

TrueSpeech Internet from the DSP Group: **http://www.dspg.com**

Audio content providers

AudioNet: **http://www.audionet.com/**

c|net Radio: **http://www.cnet.com/Content/Radio/**

CompuTalk: **http://www.computalk.com/**

Internet Jukebox: **http://interjuke.com/**

Internet Talk Radio: **http://town.hall.org/**

Internet Underground Music Archive: **http://www.iuma.com/**

Islamic Audio Studio: **http://www.bev.net/community/sedki/icb_ra.html**

National Public Radio: **http://www.npr.org/**

net.radio: **http://www.netradio.net/**

NetTalk: **http://www.nettalk.com/**

Public Broadcasting System: **http://www.pbs.org/**

QuickTime Live: **http://live.apple.com/**

Quirks & Quarks: **http://www.radio.cbc.ca/radio/programs/current/quirks/**

Radio Canada: **http://www.radio.cbc.ca/**

TheDJ: **http://www.thedj.com/**

Virtual Radio: **http://www.microserve.net/vradio**

Web Japan: **http://www.webjapan.co.jp/webjapan/**

More information

List of radio stations that use the Web: **http://american.recordings.com/WWWoM/radio/radio.html**

Yahoo's index of net radio stations: **http://www.yahoo.com/Entertainment/Radio/Internet**

A Boom Box With 10 Million Stations

ranges from online rebroadcasts of traditional radio stations to Internet-only "cybercasts." Information providers also utilize audio streaming to welcome visitors to their Web pages, even to offer an audio tour of the site. The variety of content in this burgeoning field is astounding.

NetTalk (**http://www.nettalk.com/**) is Canada's first nationally syndicated radio show about the Internet. It's hosted by Jim Carroll and Rick Broadhead, authors of *The Canadian Internet Handbook* (Prentice Hall Canada, ISBN: 0-13-329350-5). NetTalk is heard both on the air and the net. By putting the show on the Internet, NetTalk has made itself available to people online who can't hear it on the radio, as well as to Canadian listeners who may have missed a show. NetTalk is heard over the air by an estimated 600,000 to 1,000,000 listeners. But the show's potential online audience is much wider: There are about 1.5 million Canadians with Internet access – and the show is also available to the rest of the Internet community. Carroll is not sure how large the online audience is. "The whole concept of audio on the net is new. People are just beginning to explore what's possible here," he says.

Because so many different audio technologies are available, information providers and users have to make some difficult decisions about what tools to use. You could spend a weekend just downloading and installing various helper apps and Netscape plug-ins for audio streaming. Information providers, which typically must pay for the software to encode and distribute streamed audio, often can't afford the time and expense of using more than one format. NetTalk decided to use RealAudio. "RealAudio has critical mass," Carroll says. "It does not require fast access to the net, and it's the easiest to configure."

What else is out there?

Every day, c|net radio (**http://www.cnet.com/Content/Radio/**) presents original commentary on the digital world that is created exclusively for broadcast over the Internet. CompuTalk (**http://www.neosoft.com/computalk/radio/radio.html**), calling itself the "source for geek-free computer radio," is a mainstream talk radio show about the business, politics, and personalities of the information age. If it's music you yearn for, check out Virtual

If Orson Welles came back to life and reenacted his infamous "War of the Worlds" radio broadcast, he might throw not just America, but the entire planet, into hysterics. Radio has indeed changed dramatically since 1938. Through the power of audio streaming, the pioneering broadcast medium has hooked up with the Internet to reach a truly global market. A little 200-watt station in Tallahassee doesn't have to be just a little 200-watt station in Tallahassee. That little station can now reach listeners from Florida to Finland – without an FCC license and expensive radio tower. Radio has ditched airspace for cyberspace.

Scott Bourne says he saw the revolution coming. "I'm an old radio guy," says the Columbia School of Broadcasting graduate and president of net.radio (**http://www.netradio.net**). "I saw the Internet as a way to meld the oldest technology with the newest. The train was at the station, and I said, 'I'm getting on.' "

An ambitious start-up still in its toddler stage, net.radio provides both live and archived "broadcasts" of typical radio content – classic rock, alternative rock, sports talk, etc. The idea is to provide a variety of formats via a single channel. Click on a hot button, and you hear an extended radio show (DJ included) via RealAudio (**http://realaudio.com/**), a helper application that allows you to hear audio almost instantly without download delays. While the sound quality may not be spectacular, the content possibilities are exciting.

Bourne says net.radio will be able to offer market-specific content on demand, pleasing consumers and advertisers alike. This means, for example, whether you're sitting in a grass hut in Tahiti or in an igloo in Alaska, you'll still be able to hear broadcasts of your favorite hometown baseball games. "We could do an all barber shop quartet network, and get an ad that only sells straw hats," Bourne says.

More than 40,000 regular users strewn across 70 countries listen to net.radio – not bad for a 14-employee start-up operating out of Minneapolis. The site currently boasts eight sponsors, and recently signed IBM, its first high-profile name. The "station" receives about 2,000 e-mail messages a day. The fans' biggest misconception? "People misunderstand that we're not just porting over a local radio station. We don't have a frequency, and we don't have a tower," Bourne says.

–Jon Phillips

Radio (**http://www.vradio.com/vr.html**) and the Internet Underground Music Archive (**http://www.iuma.com/pages/home_page/homepage.html**). Both are online warehouses of tunes, mostly by unknown, unsigned bands (with some exceptions).

Two-thirds into his career, Ken Rutkowski is finally beginning to realize success. Not bad for a four-month-old career. Rutkowski is the host and creative force behind TechTalk, a talk show about digital technology ostensibly based in Chicago that reaches international audiences via a RealAudio-fueled Web site (**http://www.ttalk.com/**). Since the beginning of 1996, Rutkowski has graduated from being a regular Joe with yet another Web-based business to an entrepreneur who's invited to evangelize at major trade shows. The magic behind the weekly broadcast is Rutkowski's ability to connect Hollywood celebrities and industry insiders – big industry insiders – with listeners from Australia to Canada to Taiwan. "I don't even take Chicago into consideration," says the 29-year-old personification of the Energizer bunny.

Rutkowski describes some of his guests.

• *Star Wars* legend Mark Hamill: "He's pumpkin pie. Humble. Incredibly down-to-earth. Probably what Luke Skywalker would really be like."

• Mac evangelist Guy Kawasaki: "The high priest of Macintosh. He's a warrior."

• PC guru John Dvorak: "Very critical. He's your tech mother-in-law, so don't screw around with him."

• Penthouse Pet Julie Strain: "Very quick-witted. Totally fearless."

• Sadsack Rodney Dangerfield: "He has no idea what he's doing with technology. He's your grandpa on the computer."

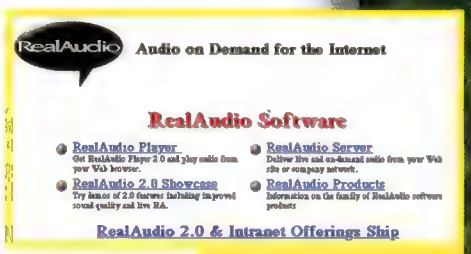
Though Rutkowski draws liberally from a pool of traditional celebrities, no one makes it on his show without a tech angle. Indeed, it's TechTalk's mixture of glitz and silicon that has created such a stir. Rutkowski keeps a tight lip when asked about immediate expansion plans, but waxes poetic on what he would like to experience in the future: "I'm looking forward to streamed audio and video on the net, fully interactive. I want people to see the show. I want people calling right from their PCs. I want to actually touch the people I'm talking to."

–Jon Phillips

The Internet Jukebox (**http://interjuke.com/jukebox**) lets you listen to entire albums while you surf the net. Billing itself as the world's first 24-hour-a-day, live, Internet-only radio network, net.radio (**http://www.netradio.net/**), specializes in vintage rock, unsigned bands, and classical music, as well as news and sports. If that's not enough, try TheDJ (**http://www.thedj.com/**), a customizable music service providing tunes in a dozen genres.

TheDJ (http://www.thedj.com/) is a customizable music service providing tunes in a dozen genres.

More online audio choices include "Quirks & Quarks," Canada's weekly national science show focusing on technology, medicine, space, and the environment (**http://www.radio.cbc.ca/radio/programs/current/quirks/**). Although much of the material available with streaming audio is canned and pre-recorded, you can also find "live" shows. For example, Apple Computer hosts a series of special events at its QuickTime Live site (**http://live.apple.com/**), such as The Sundance Film Festival and the Grammy Awards. AudioNet (**http://www.audionet.com/**) provides live broadcasts of a dozen talk and music radio stations. It also offers numerous live sporting events. In a unique use of the medium, AudioNet also presents several audio books. Internet audio is not an English-only phenomenon. Sites such as the Islamic Audio Studio (**http://www.bev.net/community/sedki/icb_ra.html**) and Web Japan (**http://www.webjapan.co.jp/webjapan/**) offer information in foreign tongues. National Public Radio's Web site (**http://www.npr.org/**) has news and election coverage, as well as many of its popular shows. Richard Dean, producer of new media services at National Public Radio, is excited about the benefits of publishing audio on the Internet, though he notes some drawbacks. "As a listener, it's a great thing. As a radio programmer, maybe it's not such a great thing – it disturbs the continuity of the program," he says. "Instead of pushing info at someone, you allow listeners to come get it from you." He adds: "The biggest problem with radio is that your work is really ephemeral. It hits the aether and it's gone." Because a transcript can't capture the nuances of a news story, and audio tapes take time to arrive, the Internet gives NPR listeners the ability to hear – or re-hear – a story at any time, when it's convenient. "This is where radio broadcasting – information-providing – is going," Dean says.



RealAudio (http://www.realaudio.com/) provides good speech and music clarity.

National Public Radio's site (http://www.npr.org/) lets you listen to the news any time.

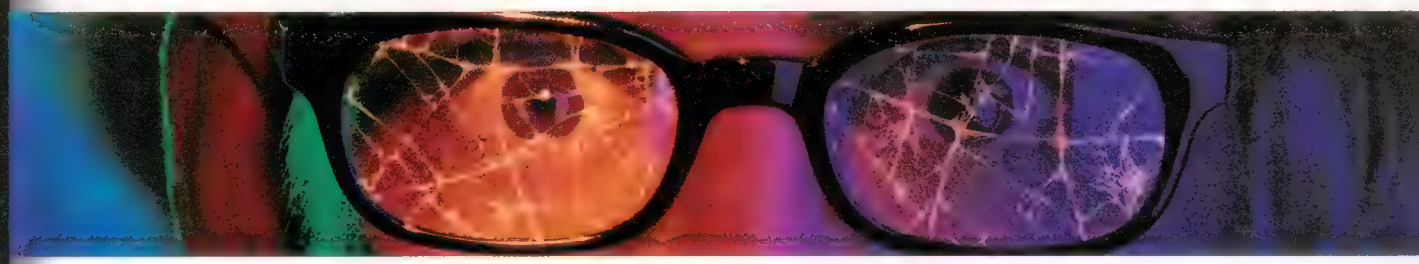
Virtual Radio (http://www.vradio.com/vr.html) is a music broadcast site.

Getting Nrrrdy With Tinsel Town Technophiles

Sound Off

Use the Net as a Cheap Alternative to Long-Distance Calling

by Kevin M. Savetz



Forget Internet Relay Chat. Forget about trying to talk to your fellow Internet users using the Unix "talk" command. Forget about those hackish Web chat sites. If you want to talk with others on the Internet, just say "hi."

In recent months, several programs have become available that let you, if you're equipped with a multimedia computer and special software, speak in real-time over the Internet, using the network like a telephone. Some of the available programs that do voice on the net are free. Others are commercial. Most of these products are ready for prime time, though others are still being tested.

Imagine doing your regular online thing – maybe reading your e-mail or checking out some Web pages – when the computer "rings." It's an incoming call. You switch to your audioconferencing software, click "answer," and then you're chatting in real-time with your boss, your mom, or anyone else with an Internet connection, anywhere in the world. All it takes is a Mac, Windows, or OS/2 PC with a microphone and sound card, a SLIP or PPP connection, and a modem or a LAN. Amazingly, for most of these programs, a 14.4 Kbps modem is enough to transmit intelligible voices, and even 9600 bps is sometimes enough bandwidth.

CyberPhone's software (http://magenta.com/cyberphone/) provides excellent sound quality.

Audioconferencing programs work by digitizing your speech and sending the digital data over the Internet, compressing it along the way. The person you're talking to must have compatible software that decompresses the audio and plays your voice out of the computer's speaker.

I'm not suggesting that your PC and modem will replace Ma Bell anytime soon. The obvious drawback of online audio is that you can only talk to associates with

The Software You Need

CU-SeeMe
Macintosh and Windows
http://cu-seeme.cornell.edu/
CU-SeeMe is a project of Cornell University that allows for audio and videoconferencing over the Internet. Sound quality is good, but you might have problems with a 14.4 Kbps connection.

Cyberphone
Windows and Unix
http://magenta.com/cyberphone/
Cyberphone offers useful features, such as a good user directory, text-based chat, and user-to-user file transfers. It also provides excellent sound quality.

DigiPhone
Windows
http://www.planetcers.com/
DigiPhone comes by itself, or in a complete package that includes a Web browser and functionality for e-mail, Telnet, FTP, voice messaging and caller ID.

Continued on next page

Intercom
Windows
http://www.telescape.com/html/HOME-PG.HTM
Although it doesn't have a user directory, Intercom allows integration with your e-mail and file transfer programs. It also lets you display a picture of yourself so other users can see what you look like.

Internet Phone
Macintosh and Windows
http://www.vocaltec.com/
Internet Phone runs on top of Internet Relay Chat, providing you with a list of online users and topics of conversation to choose from. It makes it easy to find new people to chat with. Its proprietary compression scheme, though, means that it is incompatible with other applications.

Maven
Macintosh
ftp://sunsite.unc.edu/pub/packages/infosystems/maven
Maven was the first Internet audio conferencing tool for the Macintosh. It is free software that can talk to other Macs that are running Maven, as well as to the Unix "vat" program.

NetPhone
Macintosh
http://www.emagic.com/
NetPhone is a robust commercial program that offers many features unavailable in other Mac products.

PowWow
Windows
http://www.tribal.com/
Providing delayed voice communication, PowWow is one of the better personal communications applications. If its voice communications are improved to support real-time communication, PowWow would easily be one of the best applications available.

Continued on page 38

similarly equipped hardware. Although there are millions of folks with Internet accounts, it will probably be many years before all of your friends and relatives are on the net.

Audio Quality

Surprisingly, if you have a good Internet connection, the sound quality is comparable to what you get with a regular phone call. However, sound quality varies dramatically between applications, and depends largely on the bandwidth limitations at each end. If you have a good local network connection, then some applications provide sound quality that is significantly better than a regular telephone call, because they use 16-bit signals rather than the 8-bit signals used in regular phone lines.

The quality of the audio you'll send and receive depends on the application you're using, the speed of your computer, and the compression method used. Still, talking across the country or around the world for the cost of an Internet connection is amazing, and easy on the wallet. Depending on the software, talking over the Internet may be more like using CB radio than a telephone. Unlike a phone conversation, which you can interrupt, or inject "uh-huhs" into, several of today's programs allow only one person to speak at a time. It's called half-duplex conversation, and it means that you must wait for the speaker to release the line before you can respond.

Even if your software allows full-duplex, real-time conversation, there's always a short but sometimes noticeable gap between when you speak and when your associate hears your words. The modems themselves introduce about a quarter-second of "latency" in the sound transmission after doing their work of buffering, error correcting, and data compression.

Some audioconferencing programs use proprietary compression methods that make it impossible to talk with users of other products. To talk to others using different software, you need to have the same type of connection scheme and the same type of

Telescape's Intercom (http://www.telescape.com/html/HOME-PG.HTM) is Windows-only software that lets you display a picture of yourself for other users to see.

Webphone (http://www.itelco.com/) offers advanced features such as voice mail, WWW integration, multiple lines for simultaneous calls, a message board for text communications, and a user directory.

PowWow, for Windows only (http://www.tribal.com/) is one of the better personal communications applications.

compression. It may also be possible to talk to users using a different computer platform (PC, Mac, or Unix) than you: Speak Freely (**http://www.fourmilab.ch/netfone/windows/speak_freely.html**) and Cyberphone (**http://magenta.com/cyberphone/**) offer full compatibility between Windows and Unix users. CU-SeeMe (**http://cu-seeme.cornell.edu/**) and Internet Phone (**http://www.vo caltec.com/**) offer compatibility between Mac and PC users using the same application.

Some programs go far beyond merely emulating a telephone. Toys are available in various programs that let an answering machine answer your digital telephone when you're not there; or give you the ability to have a conference call among three or more people; or provide encrypted data to protect your conversation from hackers.

The phone companies aren't very pleased with the Internet telephony trend. A group of 130 telecommunications companies called the America's Carriers Telecommunication Association (ACTA) has asked the Federal Communications Commission to stop companies from selling software and hardware products that enable the use of the Internet for long-distance voice communication (*The Net* June 96, page 17). ACTA submits that it is not "in the public interest to permit long-distance service to be given away, nor is it in the public interest for these select telecommunications carriers to operate outside the regulatory requirements applicable to all other carriers." For more information, visit the VONYES Coalition home page (**http://www.von.com/vonyes/**).

Large long-distance companies, such as AT&T, are less concerned with net telephony – after all, they also make money by selling Internet bandwidth to Internet service providers.

A free program, TeleVox (http://www.voxware.com/) lets you change the way your voice sounds using "voice fonts."

Internet Phone (http://www.vocaltec.com/) offers compatibility between Mac and PC users using the same application.

PGPfone
Macintosh and Windows 95
http://web.mit.edu/network/pgpfone/
Hailing from the makers of the PGP encryption scheme, PGPfone offers audio encryption over the Internet. The encryption scheme used in the application is only available in the U.S. This is a free program.

Speak Freely
Windows and Unix
http://www.fourmilab.ch/netfone/windows/speak_freely.html
Speak Freely is one of the best applications available. It offers voice mail and encryption, and usually provides excellent sound quality.

TeleVox
Windows
http://www.voxware.com/
A free program, TeleVox lets you change the way your voice sounds using "voice fonts."

Webphone
Windows
http://www.itelco.com/
Webphone gives users a slick interface that looks like a cellular phone. It also offers advanced features, such as voice mail, World Wide Web integration, multiple lines for simultaneous calls, a message board for text communications, and a user directory.

Webtalk
Windows
http://webtalk.quarterdeck.com/
Webtalk offers good integration with the World Wide Web, and provides nice sound quality. Other features include a message board for text, and a user directory.

For More Information

A complete and up-to-date guide to Internet telephony can be found at the Internet Telephony page (http://rpcp.mit.edu/~asears/main.html).

Also, check out the FAQ, "How can I use the Internet as a telephone?," at http://www.northcoast.com/~savetz/voice-faq.html or http://rpcp.mit.edu/~asears/voice-faq.html.